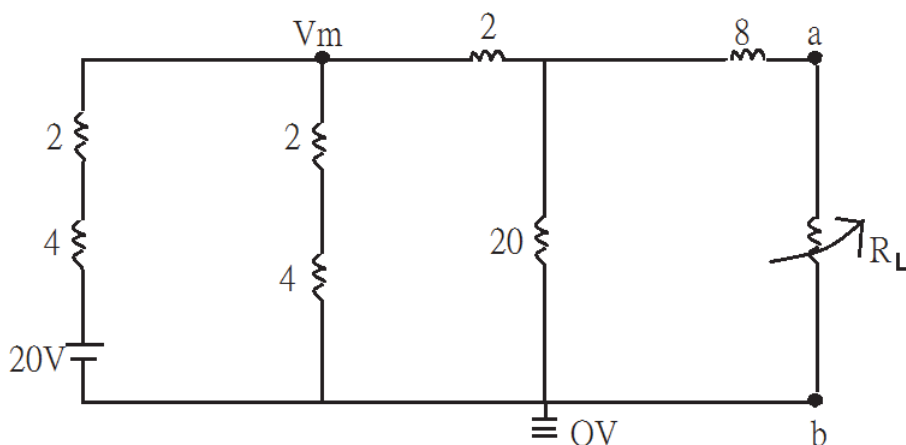


基本電學⑮—補充教材

基本電學講義 4~8 P176 第 6 題

第(1)題

將原電路利用 $\nabla \rightarrow Y$ 接

利用戴維寧定理解之：

$$R_{th} = \{[2 + (6//6)]//20\} + 8 = 4 + 8 = 12 (\Omega)$$

當 $R_L = R_{th}$ 時，可得消耗功率最大故 $R_L = R_{th} = 12 (\Omega)$

第(2)題

(一)求 P_{out}

$$\text{如圖 } V_m = I_T \times R_{\text{並}} = \left(\frac{20}{6}\right) \times (6//6//22) = 8.79(V)$$

$$\text{利用分壓 } E_{th} = 8.79 \times \frac{20}{20+20} = 8(V)$$

$$P_{out} = P_{\max(L)} = \frac{(E_{th})^2}{4R_{th}} = \frac{(8)^2}{4 \times 12} = 1.333(W)$$

(二)求 $P_{in} \sim \times R_L$ 放回 ckt 中

$$R_T = \{ \{ [(8 + 12) // 20] + 2 \} // 6 \} + (2 + 4) = 4 + 6 = 10 (\Omega)$$

$$P_{in} = \frac{V^2}{R_T} = \frac{(20)^2}{10} = 40(W)$$

(三)效率(η)

$$\eta = \frac{P_{out}}{P_{in}} \times 100\% = \frac{1.333}{40} \times 100\% = 3.333\%$$

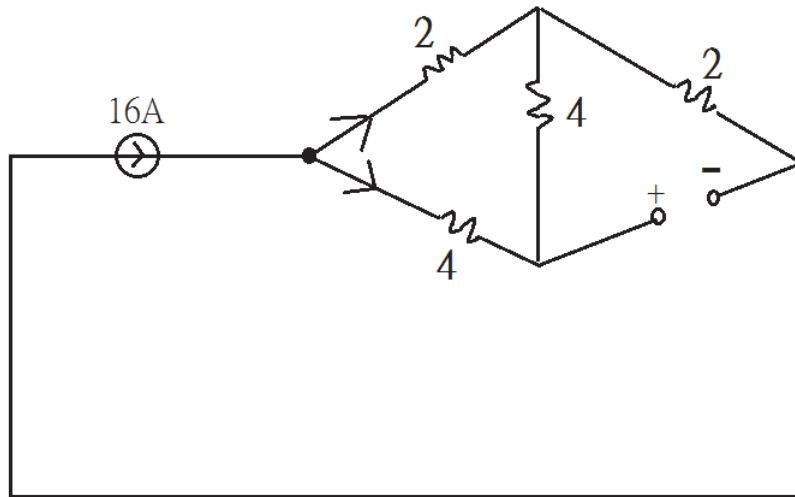


基本電學講義 4~8 P176 第 7 題

(一)求 I_a ~ ※把 2Ω 拿掉

$$R_{th} = 2 + [(8//8)/(4+2)] = 2 + 2.4 = 4.4(\Omega)$$

$$\begin{aligned} E_{th} &= \left[\left(16 \times \frac{2}{2+(4+4)} \right) \times 4 \right] + (2 \times 16) \\ &= 12.8 + 32 \\ &= 44.8(V) \end{aligned}$$



$$I_a = \frac{44.8}{4.4+2} = 7(A)$$

↖ 放回 2Ω

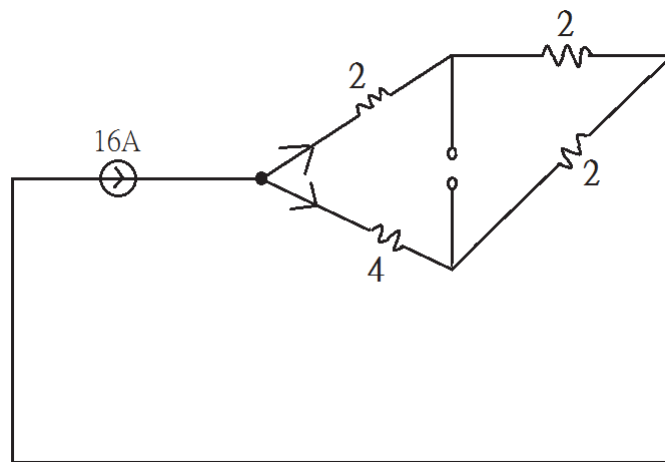
(二)求 V_o ~ ※把 $8\Omega // (1\Omega + 3\Omega + 4\Omega)$ 拿掉

$$R_{th} = (4+2)/(2+2) = 6/4 = 2.4(\Omega)$$

$$\begin{aligned} E_{th} &= \left(16 \times \frac{6}{6+4} \times 2 \right) - \left(16 \times \frac{4}{4+6} \times 2 \right) \\ &= 19.2 - 12.8 \\ &= 6.4(V) \end{aligned}$$

$$I = \frac{6.4}{2.4+4} = 1(A)$$

$$V_0 = 1 \times 4 = 4(\text{V})$$



基本電學講義 15~20 P110 第 2 題

(一)考慮 $3\sin(t)$ 之電流源 Let 電壓源 S.C

$$Z_T^1 = (j2 // -j1) = -j2 = 2 \angle -90^\circ (\Omega)$$

$$V' = i \times Z_T = 3 \angle 0^\circ \times 2 \angle -90^\circ = 6 \angle 0-90^\circ = 6 \angle -90^\circ$$

$$V'_{(t)} = 6\sin(t-90^\circ) (V)$$

(二)考慮 $14\cos(3t+30^\circ)$ (V) 之電壓源，Let 電流源 O.C

$$Z_T'' = -j0.5 + j4 = j3.5 = 3.5 \angle 90^\circ (\Omega)$$

$$V'' = 14 \angle 30^\circ \times \frac{j4}{Z_T''} = 14 \angle 30^\circ \times \frac{4 \angle 90^\circ}{3.5 \angle 90^\circ} = 16 \angle 30^\circ (V)$$

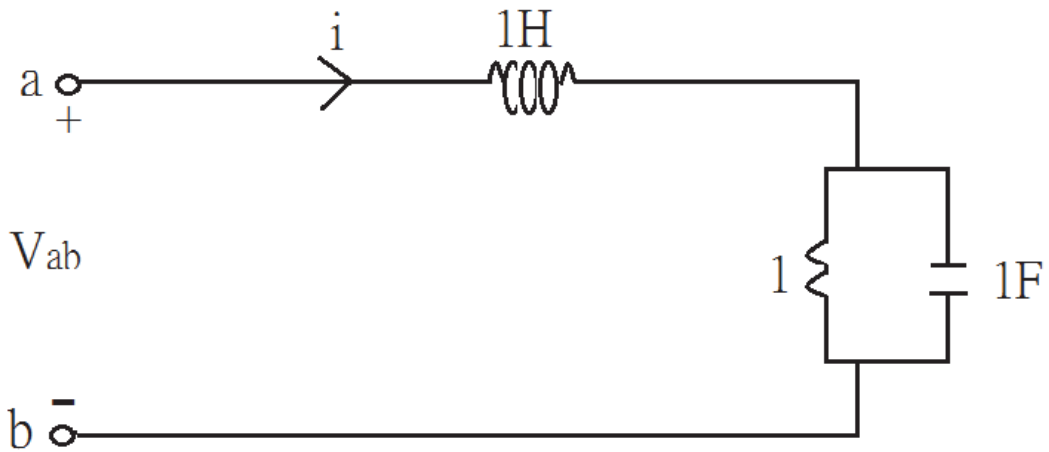
$$V''_{(t)} = 16\cos(3t+30^\circ) (V)$$

(三)合併

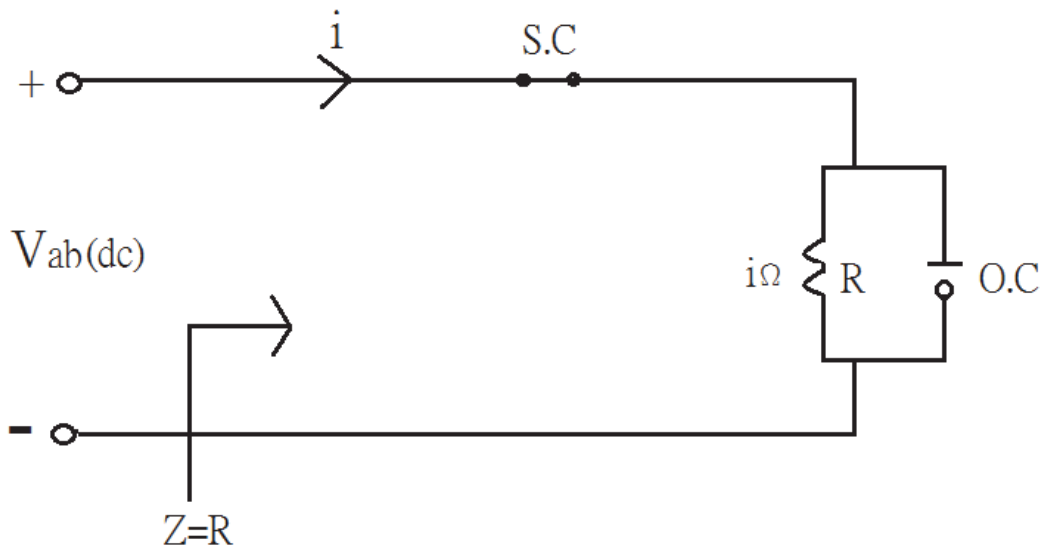
$$\begin{aligned} V_{(t)} &= V'_{(t)} + V''_{(t)} \\ &= 6\sin(t-90^\circ) + 16\cos(3t+30^\circ) (V) \end{aligned}$$

基本電學講義 15~20 P110 第 3 題

(一)DC 成份時

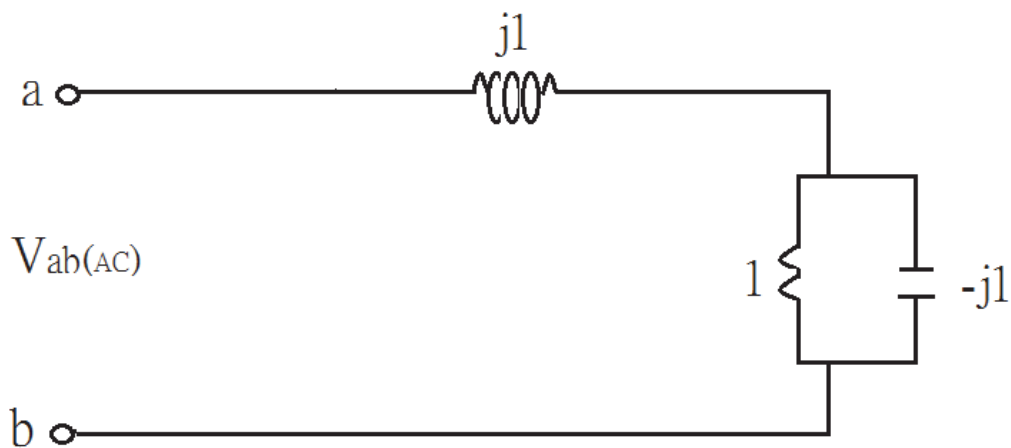


當考慮 DC 成份時



$$V_{ab(dc)} = i \times Z = 3 \times 1 = 3(V)$$

(二)AC 成份時



$$Z = (-j//1) + j1 = \frac{1+j1}{2} = 0.707 \angle 45^\circ (\Omega)$$

$$V_{ab(AC)} = i \cdot Z = 4 \angle 0^\circ \times 0.707 \angle 45^\circ = 2.83 \angle 45^\circ = 2.83 \cos(t + 45^\circ) (V)$$

(三)合併

$$\begin{aligned} V_{ab} &= V_{ab(dc)} + V_{ab(AC)} \\ &= 3 + 2.83 \cos(t + 45^\circ) (V) \end{aligned}$$